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**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE
LUMUMBA
RUDN University**

Academy of Engineering

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

Structural Design in Steel: Special Topics

course title

Recommended by the Didactic Council for the Education Field of:

08.04.01 Civil Engineering

field of studies / speciality code and title

**The course instruction is implemented within the professional education programme
of higher education:**

Civil Engineering and Built Environment

higher education programme profile/specialisation title

1. COURSE GOAL(s)

The goal of the course Structural Design in Steel: Special Topics is to gain knowledge, skills, skills and experience in the field of theory and design of buildings and structures that characterize the stages of competence formation and ensure the achievement of the planned results of the development of the educational program.

The main objectives of the course Structural Design in Steel: Special Topics are:

- training of specialists of a wide profile in industrial and civil construction with an in-depth study of the basics of design, manufacture, installation, reinforcement of metal structures of buildings and structures;
- formation of skills of calculations and design of metal structures from the point of view of specific engineering tasks using design norms, standards, reference books;
- obtaining skills in the use of automation tools for the design of metal building structures.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The course Structural Design in Steel: Special Topics implementation is aimed at the development of the following competences (competences in part):

Table 2.1. List of competences that students acquire during the course «Structural Design in Steel: Special Topics»

Competence code	Competence descriptor	Competence formation indicators (within this course)
PC-2	Development of project products based on the results of engineering and technical design for urban development activities	PC-2.1 Capable of performing engineering and technical design and developing design products for building structures, grounds and foundations

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course Structural Design in Steel: Special Topics refers to the *elective component* of (B1) block of the higher educational programme curriculum.

Within the higher education programme students also master other disciplines (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the course Structural Design in Steel: Special Topics.

Table 3.1. The list of the higher education programme components that contribute to the achievement of the expected learning outcomes as the internship results.

Competence code	Competence descriptor	Previous courses / modules, internships	Subsequent courses / modules, internships
PC-2	Development of project products based on the results of engineering and technical design for urban development activities	Digital technologies in construction; Structural Design in Steel; Nanotechnology in Civil Engineering; Structural Design in Reinforced Concrete; Building materials: Special Topics	Life Cycle Economics of Buildings; Applications of Finite Element Method for Civil Engineering problems; Sustainability in Civil Engineering; Optimization Methods in Civil Engineering; Structural Stability; Geometric Shaping and Analysis of Shells; Engineering Systems of Buildings; Desin Practice;

			Technological Practice; Pre-Graduation Practice
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4. COURSE WORKLOAD

The total workload of the course **Structural Design in Steel: Special Topics** is 5 credits.

Table 4.1. Academic activities types by periods of the higher education programme

Type of academic activities		Total academic hours	Semester(s)			
			2			
<i>Contact academic hours</i>		72	72			
including:						
Lectures (LC)		36	36			
Lab works (LW)		0	0			
Seminars (workshops / tutorials) (S)		36	36			
<i>Self-studies academic hours</i>		72	72			
<i>Evaluation and assessment academic hours</i>		36	36			
<i>Course work / project, credits</i>			2			
Course workload	academic hours	180	180			
	credits	5	5			

5. COURSE CONTENTS

Modules	Contents (topics)	Academic activities types *
Section 1. Introduction to steel structures	Introduction: Building codes, Seismic forces, Analysis, and design of complex structures. Loads, philosophy of design, steel and properties	LC, S
Section 2. Beam-Column Design	Interaction equations. Effects of moment gradient loading. Design resistance of beam-column members. Methods of Analysis for Required, Strength, The Moment Amplification Method, Braced versus Unbraced Frames, Members in Braced Frames, Members in Unbraced Frames, Design of Beam-Columns, Trusses with Top-Chord Loads Between, Joints	LC, S
Section 3. Plate girders	Introduction, General Considerations, AISC Requirements for Proportions of Plate, Girders ; Flexural Strength, Shear Strength Bearing Stiffeners, Design	LC, S
Section 4. Connection: Welding and bolting and design codes and analysis of steel using computer software	Concept of welding process. Type of welded connections and failure mode. Design of welded connections, Type of bolted connections and failure mode. Design of bolted connections. Discussion of different design codes	LC, S

Modules	Contents (topics)	Academic activities types *
	and analysis of steel structural system by using computer software	

* - to be filled in only for full -time training: LC - lectures; LW - lab work; S - seminars.

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	Classroom equipment	Specialized educational / laboratory equipment, software and materials for course study (if necessary)
Lectures	An auditorium for conducting lectures, equipped with a set of specialized furniture; a blackboard (screen) and technical means for multi-media presentations.	
Seminars	A classroom for conducting seminars, group and individual consultations, current and midterm assessment; equipped with a set of specialised furniture and technical means for multimedia presentations.	
Computer Labs	Not required.	
Self-studies	A classroom for independent work of students (can be used for seminars and consultations), equipped with a set of specialised furniture and computers with access to the electronic information and educational environment	

7. RESOURCES RECOMMENDED FOR INTERNSHIP

Main readings:

1. Handbook of structural steel connection design and details. Akbar R. Tamboli.
<https://drive.google.com/file/d/1F2qQ2Ae8VOOyP-p2K4JxByBWjcaFtBvl/view>

Additional readings:

- Filippo Berto (Ed.), Ricardo Branco (Ed.). Mechanical Behavior of High-Strength Low-Alloy Steels 2023. 1 c. ISBN 9783038972044 URL:
<https://www.mdpi.com/books/pdfview/book/767>
- Smart Lesley, Gagan Michael. Structures of metals // The Molecular World: The Third Dimension. 2022. ISBN 0-85404-660-7 DOI: <http://dx.doi.org/10.1039/9781847557902-00015>
- Al-Samman T. Material and Process Design for Lightweight 2019. 1 c. ISBN 9783038979586 URL: <https://mdpi.com/books/pdfview/book/1319b>

Internet sources:

- Electronic libraries (EL) of RUDN University and other institutions, to which university students have access on the basis of concluded agreements:
 - RUDN Electronic Library System (RUDN ELS) <http://lib.rudn.ru/MegaPro/Web>
 - EL "University Library Online" <http://www.biblioclub.ru>
 - EL "Yurayt" <http://www.biblio-online.ru>
 - EL "Student Consultant" www.studentlibrary.ru
 - EL "Lan" <http://e.lanbook.com/>
 - EL "Trinity Bridge"

2. Databases and search engines:

- electronic foundation of legal and normative-technical documentation <http://docs.cntd.ru/>
- Yandex search engine [https:// www .yandex.ru/](https://www.yandex.ru/)
- Google search engine <https://www.google.ru/>
- Scopus abstract database <http://www.elsevier.com/locate/scopus/>

The training toolkit and guidelines for a student:

1. Collection of lectures on the course Structural Design in Steel: Special Topics.

* The training toolkit and guidelines for the course are placed on the internship page in the university telecommunication training and information system under the set procedure..

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL AS INTERNSHIP RESULTS

The assessment toolkit and the grading system* to evaluate the level of competences (competences in part) formation as the course Structural Design in Steel: Special Topics results are specified in the Appendix to the internship syllabus.

* The assessment toolkit and the grading system are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

DEVELOPERS:

Associate Professor in the Department
of Construction Technology and
Structural Materials

position, educational department

signature

M.I. Rynkovskaya

name and surname

position, educational department

signature

name and surname

HEAD OF EDUCATIONAL DEPARTMENT:

Head of the Department of
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**HEAD OF
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